

Notes on a Collection of Amphibians and Reptiles from El Salvador

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Abstract

We report here on recent collections of amphibians and reptiles from El Salvador, in western Central America. More than 600 specimens of amphibians and reptiles were collected on field trips during 2001 and 2002, representing 51 species: one salamander, 11 anurans, 22 lizards, and 17 snakes. One lizard, *Mesoscincus managuae* (Sauria: Scincidae) is a new national record. Conservation needs and activities in the country are also discussed.

Keywords

El Salvador, Central America, herpetofauna, biogeography, Amphibia, Reptilia.

Introduction

The amphibians and reptiles of El Salvador have remained largely unstudied during the 5 decades since Mertens' work in the 1950s (see review by Köhler 1996). In part, this is because the herpetofauna of El Sal-

vador is depauperate; many of the species occur generally throughout the arid Pacific zones of Central America and have been studied to some extent in neighboring countries (Sasa and Solórzano 1995). This lack of baseline biodiversity data for a well-known vertebrate group exemplifies the challenges facing attempts to understand and preserve the biota of El Salvador.

El Salvador lies on the Pacific coast of Central America, between Guatemala and Honduras (Figure 1), and is the smallest and most densely populated country in the region, with an expanding human population approaching 300 people per square kilometer. El Salvador is dotted with volcanoes, and its fertile volcanic soil has given rise to widespread agricultural activity. The country is thought to have been completely forested up until the time of European contact in the 16th century. However, most of the native flora was destroyed before it could be studied by botanists (Harcourt and others 1996), and the fauna is in a comparable situation.

Table 1.

Gazetteer. Numbers correspond to collecting sites in Figure 1.

1. Ahuachapán: Municipio San Francisco Menendez: Cantón Escoroso: Parque Nacional El Imposible, Sector La Fincona; 780 m elevation (lat 13.847°N, long 89.981°W).
2. Ahuachapán: Municipio San Francisco Menendez: Cantón Escoroso: Parque Nacional El Imposible, Sector San Benito; 800 m elevation (lat 13.823°N, long 89.943°W).
3. Ahuachapán: Municipio San Pedro Puxtla: Cantón La Concepción: Cooperativa Concepción Miramar; 950 m elevation (lat 13.810°N long 89.807°W).
4. Chalatenango: Municipio San Ignacio: Cantón Las Pilas: Caserio El Centro: Cerro Las Nubes, SE slope of Cerro El Pital; 2,050 m elevation (lat 14.393°N, long 89.105°W).
5. La Libertad: Municipio La Libertad: 2 km south of Zaragoza: Río San Antonio; 740 m elevation (lat 13.552°N, long 89.288°W).
6. La Libertad: Municipio La Libertad: Ciudad Merliot: Colonia: Jardines del Volcán, on slope of Volcán El Boquerón; 900 m elevation (lat 13.76°N, long 89.35°W).
7. La Paz: Municipio Zacatecoluca: Finca La Esmeralda, 3 km east of Zacatecoluca; 115 m elevation (lat 13.483°N, long 88.850°W).
8. Morazán: Municipio Arambala: Cantón Joya el Matazano: Caserio Los Cimientos, 1.5 km SE of Cerro Cacahuatique; 1,010 m elevation (lat 13.767°N, long 88.200°W).
9. Morazán: Municipio Arambala: Cantón Cumaro: Bailadero del Diablo; 696 m elevation (lat 13.931°N, long 88.102°W).
10. Morazán: Municipio Arambala: Cantón Cumaro: Nahuaterique, near border crossing with Honduras; 1,389 m elevation (lat 13.995°N, long 88.093°W).
11. Morazán: Municipio Arambala: Cantón Cumaro: Río Negro; 1,034 m elevation (lat 13.977°N, long 88.129°W).
12. Morazán: Municipio Arambala: Cantón Cumaro: Río Sapo; 1,118 m elevation (lat 13.959°N, long 88.132°W).
13. San Miguel: Cantón El Volcán: N slope of Volcán San Miguel, Finca Santa Isabel; 800 m elevation (lat 13.468°N, long 88.267°W).
14. San Salvador: Municipio Mejicanos: Cantón Zacamil: Residencial Metrópolis Norte; 740 m elevation. (lat 13.85°N, long 89.13°W).
15. San Salvador: Municipio San Salvador: Colonia Costa Rica: Parque Zoológico Nacional; 700 m elevation (lat 13.73°N, long 89.09°W).
16. San Salvador: Municipio San Salvador: Colonia Campestre, Pasaje Los Andes 2; 882 m elevation (lat 13.702°N, long 89.250°W).
17. Santa Ana: Municipio Metapán: Cantón Tecomapa: N side of Lago de Güija; 425 m elevation (lat 14.30°N, long 89.50°W).
18. Santa Ana: Municipio Metapán: E side of Volcán San Diego: Area Protegida San Diego y La Barra; 450 m elevation (lat 14.262°N, long 89.470°W).
19. Santa Ana: Municipio Metapán: Cantón Metapán: Parque Nacional Montecristo; 1,904 m elevation (lat 14.401°N, long 89.362°W).
20. Santa Ana: Municipio Santa Ana: Cantón Los Flores: Parque Nacional Los Andes and Volcán Santa Ana; 1,791 m elevation (lat 13.869°N, long 89.620°W).
21. Santa Ana: Municipio Metapán: W of Cerro San Diego, on road to Azuacalpa, N side of Lago de Güija; 445 m elevation.
22. Sonsonate: Municipio Izalco: Cantón Las Lajas: Bosque Las Lajas; 750 m elevation (lat 13.829°N, long 89.567°W).
23. Sonsonate: Municipio Izalco: Cantón Cruz Grande: Finca Nuevos Horizontes; 1,250 m elevation (lat 13.821°N, long 89.653°W).



Figure 1. Map of El Salvador showing field sites visited during this study. Numbered sites correspond to entries in Table 1. Map drawn by Leenders.

Most of the land in El Salvador is now dedicated to agriculture, and little native habitat remains. The major crops are coffee, cotton, maize and sugar cane (Harcourt and others 1996).

El Salvador has distinct rainy and dry seasons. From November through May the lack of rain causes rivers to dry and deciduous trees to drop their leaves, and strong seasonal trade winds (known locally as "El Norte") increase desiccation. The rainy season begins in June, and is the primary determinant in the reproductive cycles of both plants and animals. The two main habitats found in El Salvador are tropical

dry broadleaf forest at low elevations (below about 1,200 m), and tropical moist broadleaf forest at higher elevations (above 1,200 m).

Tropical dry broadleaf forest habitats are largely restricted to southern Mexico and the Pacific slope of Central America, and are considered to be in critical condition (Dinerstein and others 1995). Agricultural expansion in El Salvador (mostly by slash-and-burn techniques), firewood gathering, and exploitative hunting have made this ecosystem one of the most endangered in Central America. In recent years environmental awareness in El Sal-

vador has grown, and the Salvadoran government and local nongovernmental organizations have begun to promote conservation of the country's resources and natural areas. Nevertheless, only about 0.8% of the country lies in national parks or wildlife refuges, and only half of this area has been legally declared protected (Rodríguez 1998). In addition, much of the protected areas constitute previously disturbed habitat.

In this paper we summarize results of 3 collecting trips to El Salvador for amphibians and reptiles. Our work is part of a recent, increased interest in the herpetofauna of the country (Köhler 1999; Köhler and Kreutz 1999; McCranie and Köhler 1999; Hasbun and others 2001). Because El Salvador's herpetofauna is of significant biodiversity and economic importance, we hope this paper contributes to ongoing documentation efforts and accelerated conservation initiatives.

Materials and Methods

Staff from the Division of Vertebrate Zoology at the Peabody Museum of Natural History, Yale University (YPM), made 3 research trips to El Salvador during 2001 and 2002 (23 June through 7 July 2001, 16 December through 26 February 2002, and 23 October through 20 November 2002). The 2001 trip was primarily ornithological and included personnel from the Natural History Museum and Biodiversity Research Center of the University of Kansas. On these trips, 663 specimens of amphibians and reptiles (275 reptiles, 87 adult amphibians, 296 tadpoles, and 5 egg clumps) were collected, representing 51 species. Herpeto-

logical specimens were collected from as many different habitats, locality types, ages and morphologies as possible given the provisions of the permits.

Collecting was conducted under Resolution 14-05-01 of the Servicio de Parques Nacionales y Vida Silvestre, Dirección General de Recursos Naturales Renovables, Ministerio de Agricultura y Ganadería, and Permits MARN-DGPN-AIMA-8-01, MARN-DGPN-AIMA-01-2002, MARN-DGPN-AIMA-59-2002, and MARN-DGPN-AIMA-65-2002 from the Ministerio de Medio Ambiente y Recursos Naturales, San Salvador, El Salvador. Transportation was under CITES Permit 02399.

Most specimens were fixed in the field with a 10% buffered formalin mixture and transferred to 70% ethanol for storage and shipping. Approximately 45% of adult specimens were preserved in the field with 70% ethanol, rather than formalin, to allow for subsequent skeletal preparations. Larval amphibians were fixed and stored in a 10% buffered formalin solution. Additional notes were taken on individuals that were not collected, and these notes are deposited in the Division of Vertebrate Zoology at the Yale Peabody Museum. Reference is also made to specimens in the Senckenberg Natural History Museum and Research Institute (SMF).

Measurements of amphibians and small lizards were made using Mitutoyo Digimatic Calipers under a dissection microscope, and recorded to the nearest 0.1 mm; snakes and large lizards were measured with vernier calipers or a measuring tape to the nearest 1.0 mm. Measurements are given for snout to vent length (SVL) and total length (TL).

AMPHIBIA: CAUDATA

FAMILY PLETHODONTIDAE

Bolitoglossa cf. *conanti* McCranie and
Wilson 1993

We collected 4 specimens in Parque Nacional Montecristo. Our specimens match the description given for Parque Nacional Montecristo *Bolitoglossa engelhardti* (Schmidt 1936) by Mertens (1952). To a lesser extent, our specimens also match the original description of *Bolitoglossa conanti* McCranie and Wilson 1993. In their review of the *Bolitoglossa dunni* group, McCranie and Wilson (1993) tentatively assigned material from Parque Nacional Montecristo to *Bolitoglossa conanti*, but noted the uncertain taxonomic status of this isolated population. The *Bolitoglossa* from a nearby peak, Cerro El Pital, has recently been described as a new species (McCranie and Köhler 1999) and this may also be the case with the Parque Nacional Montecristo material (Eli Greenbaum, pers. comm. 2003).

As has been noted in other Central American *Bolitoglossa* (Leenders and Watkins-Colwell 2003a), the daytime and nighttime colors differ in these salamanders. The nocturnal color pattern is reminiscent of the banded phase of *Bolitoglossa conanti*. Specimens collected and sacrificed at night retain this color pattern. The daytime color pattern concurs with the description of *Magnadigitia engelhardti* (SMF 43042; Mertens 1952).

At night, the dorsal and lateral color (covering the top half of the costal grooves) is dark slate gray, mottled with dark bronze and black blotches; indistinct darker pigment is present in the costal grooves. The ventral and ventrolateral color (to the bottom third of costal grooves) is dark salmon

orange, and irregular gray speckling creates bright orange spots. The border between the dorsal dark gray and the ventrolateral orange areas (below the center of the costal grooves) is suffused with white speckling. The limbs are dark slate gray, except that the upper surfaces of the front limbs are suffused with white speckling.

During the day, the dorsal color is silver gray. Darker gray pigment in the costal grooves form an indistinct spot at the top and bottom of each groove that gives the appearance of 4 longitudinal rows of indistinct dark spots. A thin, indistinct dark postocular stripe is present on the sides of the head. The ventral color gradually changes from cream on the chin and throat to salmon orange below the tail. Indistinct orange blotches are also present and a dusting of light gray pigment produces a pattern of lighter spots.

One juvenile (YPM 7240) was observed at 21:45 h perched on a leaf of a *Peperomia* sp. growing on a tree stump at a height of approximately 1 m above the forest floor. The salamander's tail was recently autotomized and no regeneration is apparent yet. One individual (YPM 7243) was collected from the water-filled leaf axil of a *Heliconia* sp. approximately 30 cm above the ground, and another (YPM 7242) was found curled up in loose humus in the roots of a terrestrial bromeliad growing on the bank of a small drainage ditch (Figure 2a). These salamanders may be arboreal at night, and use terrestrial retreats.

Specimens collected: 3 adults (SVL 49.8–60.6 mm), 1 juvenile (SVL 29.7 mm). Santa Ana: Parque Nacional Montecristo: YPM 7240–7243. Elevation 1,840–1,850 m.

AMPHIBIA: ANURA

FAMILY BUFONIDAE

Bufo coccifer Cope 1866

This widespread, small toad was found in the relatively dry areas of Departamento Morazán, and our specimens agree with the description in Mertens (1952). The presence of a small juvenile at the Bailadero del Diablo site on 8 November 2002 suggests that reproductive activity had taken place during the preceding rainy season. Absence of larvae in known *Bufo coccifer* habitat (as indicated by the presence of adults) suggest that even drought-tolerant species such as *Bufo coccifer* may aestivate and not reproduce throughout the year.

Specimens collected: 4 adults (SVL 46.8–62.3 mm), 1 juvenile (SVL 19.2 mm). Morazán: Bailadero del Diablo: YPM 7230; Nahuaterique: YPM 7227–7229; Río Sapo: YPM 7231. Elevation 755–1,530 m.

Bufo marinus Linnaeus 1758

From December through February no breeding activity by this species was detected, although in 2 localities calling males were observed in January; no tadpoles or reproductive adults were found in October or November, but juveniles were collected in late June. In Central America, Zug and Zug (1979) reported a bimodal reproductive pattern, with breeding peaks in the dry and rainy seasons, and Lee (1996) suggested a protracted, bimodal or continuous breeding pattern. Our observations suggest there is a pause in reproductive activity of Salvadoran *Bufo marinus* during the dry

months of October through February. Several of the *Bufo marinus* (such as YPM 6418 and 6425) were parasitized by ticks.

Specimens collected: 9 males (SVL 75.0–142.0 mm), 1 female (SVL 151.0 mm), 4 juveniles (SVL 32.0–74.4 mm). Ahuachapán: Parque Nacional El Imposible: YPM 6443; La Libertad: Río San Antonio: YPM 6446–6447; Morazán: Bailadero del Diablo: YPM 7224; Río Sapo: YPM 7223, 7225–7226; Santa Ana: San Diego y La Barra: YPM 6445; Sonsonate: Bosque Las Lajas: YPM 6417–6418, 6425, 6441–6442, 6444.

Sight records: Ahuachapán: Cooperativa Concepción Miramar (elev. 1,000 m) Sonsonate: Finca Nuevos Horizontes. Elevation 660–1,300 m.

FAMILY HYLIDAE

AGALYCHNIS MORELETII (DUMÉRIL 1853)

Our *Agalychnis* closely match the description given by Duellman (1970, 2001). Some Salvadoran individuals have clearly demarcated white spots on the green dorsum; the spots remain visible in preservative. Calling males were observed in January, February, October and November; all had brown, spiny nuptial pads on the inside of the first finger. The single female collected (YPM 6414) contained eggs; several other gravid females were observed in January and February. In addition, tadpoles in various advanced developmental stages (Gosner stages 25 and higher) were observed and collected in January, October and November. Metamorph *Agalychnis moreletii* were found crawling on land on 4 January and 3

November. These observations suggest this species reproduces year-round in El Salvador.

Agalychnis moreletii is an adaptable species, often found in cultivated areas. Most tadpoles were collected in man-made wells and washbasins for coffee; in less disturbed habitat tadpoles were observed in shallow pools formed by streams. The records for Parque Nacional Los Andes represent the highest elevational occurrence for this species.

Specimens collected: 3 adult males (SVL 58.0–62.0 mm), 1 adult female (SVL 75.0 mm), 40 tadpoles and metamorphs. Ahuachapan: Parque Nacional El Imposible: YPM 6414, 6422–6423 (adults), 6457 (3 tadpoles), 7222 (adult), 7286–7289 (34 tadpoles); Santa Ana: Parque Nacional Los Andes: YPM 7249–7264, 7291; Sonsonate: Finca Nuevos Horizontes: YPM 6458 (3 tadpoles).

Sight records: Ahuachapán: Cooperativa Concepción Miramar. Elevation 560–1,795 m.

Ptychohyla euthysanota (Kellogg 1923)

One adult female was collected at night from epiphytic vegetation approximately 80 cm above the ground. This specimen agrees with the description in Duellman (2001). McCranie and Wilson (2002) mention the absence of this species in Honduras. The collection site of YPM 7239 is 4 km from the Honduran border. It seems likely that *Ptychohyla euthysanota* will eventually be found on the Honduran side of Cerro Montecristo.

Specimens collected: 1 adult female (SVL

33.1 mm). Santa Ana: Parque Nacional Montecristo: YPM 7239. Elevation 1,840 m.

Ptychohyla salvadorensis (Mertens 1952)

Adults of this stream-breeding species were observed on 7 November 2002 in Nahuaterique, a remnant pine forest near the Honduran border in Departamento Morazán. Two males (YPM 7235, 7237) were observed calling from vegetation along the banks of a slow-moving rocky stream, and more males were heard but not collected. YPM 7238 and 7236 were found in amplexus in a temporary puddle in a dirt road. Even though the *Ptychohyla* were apparently sexually active at this time of the year, an extended search of the stream and rain puddles did not reveal any tadpoles. A metamorph (YPM 6456) was collected on 28 May 2001, but no tadpoles were observed at the aforementioned collecting site. Our observations suggest this species has a seasonal reproductive cycle, with oviposition likely taking place early in the dry season.

Specimens collected: 3 males (SVL 30.0–32.8 mm), 1 female (SVL 36.5 mm), 1 metamorph (SVL 17.7 mm). Morazán: Cerro Cahuatique: YPM 6456, Nahuaterique: YPM 7235–7238. Elevation 1,010–1,310 m.

Scinax staufferi (Cope 1865)

The 49 tadpoles collected have the characteristically high xiphicercal tail fin of *Scinax* larvae. However, the arc of the dorsal tail fin is less pronounced than generally observed in *Scinax staufferi*. The larvae were collected on 7 November 2002 near Rio

Sapo in an isolated pool of stagnant water remaining from flooding during the rainy season. The *Scinax* tadpoles were collected along with *Rana maculata* tadpoles and metamorphs.

Specimens collected: 49 tadpoles (in 8 specimen lots). Morazán: Rio Sapo: YPM 7293–7299. Elevation 662 m.

Smilisca baudinii (Duméril and Bibron 1841)

Smilisca baudinii were observed in the Rio San Antonio locality in late June. During the dry months of December through February only a single individual was collected; it was found on vegetation near a lawn that was irrigated daily. The species can be locally common.

Specimens collected: 1 male (SVL 53.1 mm), 2 females (SVL 58.7–59.0 mm). La Libertad: Rio San Antonio: YPM 6448–6449; Sonsonate: Bosque Las Lajas: YPM 6424. Elevation 740–750 m.

FAMILY LEPTODACTYLIDAE

Eleutherodactylus rhodopis (Cope 1867 “1866”)

These diminutive leaf litter frogs were commonly seen in the Sierra de Apaneca. During the dry season individuals were invariably found in dry or drying streambeds, especially in the leaf litter at the base of dry waterfalls. In such microhabitats densities of *Eleutherodactylus rhodopis* often approached 7 to 8 individuals per square meter. Individuals were only rarely seen in forested areas surrounding these

drying streams, suggesting this species actively congregates in remnant humid areas during the height of the dry season.

Lynch (2000) separated *Eleutherodactylus rhodopis* sensu lato into 2 species: *Eleutherodactylus rhodopis* sensu stricto and *Eleutherodactylus loki*, with sympatric and allopatric populations of both species scattered across Central America and Mexico. A distribution map of the known populations of both species (Lynch 2000) shows *Eleutherodactylus loki* occurring in El Salvador, but this publication also states: “The issue of whether there are two species of the rhodopis cluster in Mexico, Belize, El Salvador, Guatemala, and Honduras remains to be tested critically.” His decision to assign Salvadoran *Eleutherodactylus* of the *rhodopis* group to *Eleutherodactylus loki* was apparently based largely on Guatemalan and Mexican material, as only a single juvenile female from El Salvador was cited. Lynch’s actions are not universally followed (see Dueñas and others 2001), although McCranie and Wilson (2002) without comment assign Salvadoran *Eleutherodactylus rhodopis* to *Eleutherodactylus loki*. Further study of Salvadoran material is needed, and for the present we maintain the usage of the senior synonym here.

Specimens collected: 9 males (SVL 19.4–24.8 mm), 4 females (SVL 25.8–31.4 mm), 1 juvenile (SVL 13.7 mm). Ahuachapán: Cooperativa Concepción Miramar: YPM 6430–6432; Parque Nacional El Imposible: YPM 6427–6429, 7244–7248; Sonsonate: Finca Nuevos Horizontes: YPM 6415–6416, 6433. Elevation 560–1,200 m.

Eleutherodactylus rupinius Campbell and
Savage 2000

Campbell and Savage (2000) recently reviewed the rugulosus group of Middle American *Eleutherodactylus* and assigned Salvadoran individuals to *Eleutherodactylus rupinius*.

YPM 6419 was discovered under a large rock at the edge of the rapidly flowing Río Guayapa in Parque Nacional El Imposible, but a concerted search of this seemingly ideal habitat yielded no additional specimens. All juvenile specimens were collected from 2 small (about 0.25 m²) stagnant puddles of water in an otherwise dry streambed at the base of the Izalco volcano. Many *Eleutherodactylus rhodopis* were found in the leaf litter on the dry stream bed surrounding these puddles. No adult *Eleutherodactylus rupinius* were found in this habitat. *Eleutherodactylus rupinius* invariably retreated into the water when approached, whereas *Eleutherodactylus rhodopis* retreated into the leaf litter. The absence of adult *Eleutherodactylus rupinius* in apparently suitable habitat with water present suggests that the species aestivates away from its stream side habitat.

Specimens collected: 1 adult female (SVL 39.3 mm), 10 juveniles (SVL 15.7–25.7 mm). Ahuachapán: Parque Nacional El Imposible: YPM 6419; Sonsonate: Finca Nuevos Horizontes: YPM 6410–6413, 6434–6439. Elevation 600–1,130 m.

Leptodactylus labialis (Cope 1877)

Three subadult specimens of this widespread species were collected in the

Perquín area, Departamento Morazán. All agree with the description in McCranie and Wilson (2002). This species was found during the hottest hours of the day in seepage and other humid areas in a predominantly dry habitat.

Specimens collected: 3 subadults (SVL 15.0–26.5 mm). Morazán: Bailadero del Diablo: YPM 7232; Nahuaterique: YPM 7233; Río Sapo: YPM 7234. Elevation 680–1,120 m.

FAMILY RANIDAE

Rana maculata Brocchi 1877

In their monograph on the systematics of the *Rana palmipes* group, Hillis and De Sá (1988) noted inconsistencies in the literature regarding the breeding habits of *Rana maculata*. Calling males and tadpoles had been observed year-round in Guatemala (Stuart 1951, 1954), whereas the breeding activity in Nicaragua is thought to be restricted to the dry season (Villa 1979). Our observations on Salvadoran populations of *Rana maculata* are consistent with the Nicaraguan observations, with reproduction apparent during the dry season. At any given time during November through February we collected tadpoles in various Gosner stages, observed egg clumps, and heard calling males. This suggests continuous reproduction from prior to November through the dry season. We also found eggs and larvae in puddles in drying stream beds and in slow-moving sections of streams.

Three males collected in December (YPM 6420–6421, 6450) had black nuptial pads on the inside of the inner finger, indi-

cating they were sexually active. Nuptial pads were absent on males collected in late June. Juveniles were collected in late June but were not observed during the dry season. YPM 6420 only has 4 toes on the left foot, with the first toe being intermediate in size to the first and second toe on the right foot. Since there are no visible injuries to the foot, this deformity was most likely caused during larval development.

Specimens collected: 15 adults (SVL 31.4–72.8 mm), 18 lots of larvae or recent metamorphs (totaling 182 individuals), 5 egg clumps. Ahuachapán: Parque Nacional El Imposible: YPM 6420–6421, 6426 (adults), 6440, 6459–6472 (tadpoles). La Libertad: Rio San Antonio: YPM 6450–6455; Morazán: Bailadero del Diablo: YPM 7268, 7270, 7280, 7282, 7303–7312; Nahuaterique: YPM 7271–7275, 7278; Rio Sapo: YPM 7269, 7281, 7301–7302; Santa Ana: Parque Nacional Montecristo: YPM 7265–7267, 7276–7277, 7279. Elevation 470–1,840 m.

REPTILIA: SAURIA

FAMILY ANGUIDAE

Mesaspis moreletii (Bocourt 1871)

In this species, the 8 mid-dorsal scale rows are heavily keeled in males and keeled in females. The lateral scales are smooth or weakly keeled. Granular scales occur on the side of head, posterior to the tympanum and in the venterolateral fold. Our specimens exhibited sexual dimorphism in color and squamation patterns. Females were uniform brown, with a broad band of (usually 8) rows of moderately keeled dorsal scales. In males, only the dorsal 8 scale

rows were brown and heavily keeled; the sides of the body were heavily spotted with dark pigment, forming a pattern of light and dark lateral cross-bands. In all specimens collected, the skin between the granular scales in the axilla and the venterolateral skin fold was heavily infested with mites. In some specimens, mites were also found underneath dorsal scales on the posterior half of the body.

The stomachs of YPM 12482 and YPM 12483 contained large parasitic worms not yet identified to species. Prey items recorded from the gut contents included Orthoptera, Coleoptera, a large larval lepidopteran, a fly, and many spiders of various taxonomic groups. YPM 12475 had a deformed right manus with only one digit, with extensive scar tissue on the hand and foreleg indicating an old wound. Vasa deferentia of YPM 12482 and YPM 12483 were strongly coiled and white, indicating sexual activity at time of collection (26 June 2001).

Specimens collected: 4 adult males (74.0–89.0 mm SVL, AVG 80.5 mm), 1 adult female (SVL 72.2 mm). Chalatenango: Cerro El Pital: YPM 12475, 12482–12484; Cerro Las Nubes: YPM 12437.

Sight records: Santa Ana: Parque Nacional Montecristo. Elevation 2,050–2,480 m.

FAMILY GEKKONIDAE

Gonatodes albogularis (Duméril and Bibron 1836)

YPM 12346 was gravid and contained a single egg; this specimen had an intact tail

and measured 90.9 mm in total length. YPM 12474 was collected in the National Zoo in San Salvador. Since this species is used as a food item for animals on exhibit, it may have been intentionally or accidentally released there.

Specimens collected: 3 adult males (SVL 35.6–43.4 mm), 1 adult female (SVL 43.7 mm), 1 juvenile (SVL 24.1 mm, TL 52.9 mm). La Paz: Finca La Esmeralda: YPM 12345–12347; San Salvador: Residencial Metrópolis Norte: YPM 12473; Parque Zoológico Nacional: YPM 12474.

Sight records: Santa Ana: Parque Nacional Montecristo. Elevation 115–800 m.

Phyllodactylus tuberculosus Wiegmann
1835

The 2 females collected during the dry season (YPM 12320, 12321) each contained 2 oviducal eggs in an advanced stage of development. The only male examined internally (YPM 12322) had strongly coiled, white vasa deferentia, suggesting it was reproductively active during the dry season. The stomach contents of 3 individuals contained remains of a cockroach, several Diptera, and Coleoptera. One gravid female (YPM 12321) had small pebbles in its stomach and intestines. An as yet unidentified parasitic worm was extracted from the gastrointestinal tract of YPM 12320.

Specimens collected: 5 males (SVL 57.8–66.8 mm), 6 females (SVL 54.5–66.7 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12320–12321, 12340–12344, 12421, 14015; Morazán: Río Sapo:

14013–14014; Sonsonate: Bosque Las Lajas: 12322. Elevation 750–800 m.

FAMILY IGUANIDAE:

SUBFAMILY CORYTOPHANINAE

Basiliscus vittatus Wiegmann 1828

Adults were observed in Parque Nacional El Imposible and Finca La Esmeralda, but the alertness of individuals of this species precluded collection. Adults of this species are commonly hunted and eaten by the local people.

Specimens collected: 6 juveniles (SVL 43–62 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12432, 12434; La Paz: Finca La Esmeralda: YPM 12433; Morazán: Río Sapo: 13996–13998.

Sight records: Ahuachapán: Cooperativa Concepción Miramar (elev. 1,100 m); Santa Ana: Parque Nacional Montecristo, 800 m. Elevation 115–1,100 m.

Corytophanes percarinatus Duméril 1856

Corytophanes percarinatus is rarely encountered in El Salvador, and seems to be restricted to large expanses of relatively undisturbed forest. McCoy (1968) examined a series of Guatemalan specimens collected in various months of the year: 4 females collected in December contained oviducal eggs lacking discernible embryos; the eggs measured 14 mm in diameter on average. Guatemalan *Corytophanes percarinatus* seem to produce a single clutch per year, with a clutch size of 3 to 10 (average 7.1); the live young are born in May or June.



Figure 2. Noteworthy herpetological records. **a**, *Bolitoglossa* cf. *conanti* from Parque Nacional Montecristo, El Salvador (YPM 7242). **b**, *Norops heteropholidotus* from Departamento Chiquimula, Guatemala (YPM 1101), first confirmed record of this species for Guatemala. See the text for additional information.

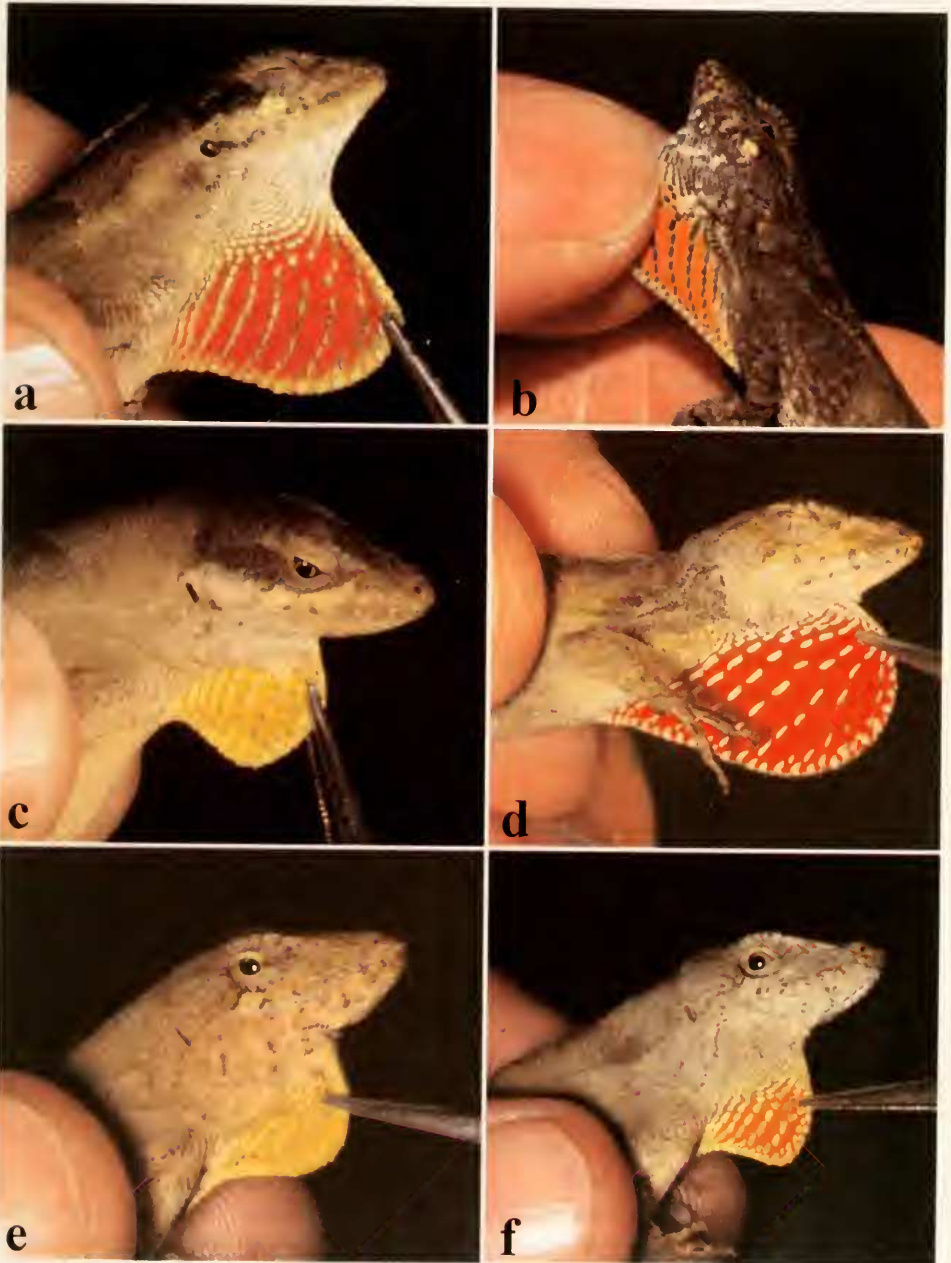


Figure 3. Variation in dewlap color in Salvadoran *Norops*. *Norops* cf. *crassulus*: a–b, male (YPM 14028); c, female (YPM 14037). *Norops heteropholidotus*: d, male (YPM 14044); e, female (YPM 14033); f, aberrant female (YPM 14057). See the text for additional information.

Specimens collected: 1 adult female (SVL 103 mm, TL 307 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12452. Elevation 720 m.

FAMILY IGUANIDAE:

SUBFAMILY IGUANINAE

Ctenosaura flavidorsalis (Köhler and Klemmer 1995)

Ctenosaura flavidorsalis was commonly encountered in sparsely populated, arid zones of Departamento Morazán. This species is hunted vigorously by local hunters.

Specimens collected: 1 adult male (SVL 134.0 mm, TL 330 mm), 1 tissue sample from uncollected specimen. Morazán: Bailadero del Diablo: YPM 13008 (adult); Rio Sapo: YPM 13007 (tail tip).

Sight records: The tissue sample taken from an autotomized tail tip from an escaped animal. Elevation 680–1,120 m.

Ctenosaura similis (Gray 1831)

A single male was collected from a hole in an area used for drying coffee, in a residential area. More were observed in the same locality but were not collected because of the difficulty of approaching the species. This species can be found near human settlements, where it is often hunted for food. Three *Ctenosaura similis* were observed in the town of San Francisco Menendez and near the visitor center of Parque Nacional El Imposible (Leenders 2003). To our knowledge, no records of this species exist yet for Departamento Ahuachapán.

Specimens collected: 1 adult male (SVL 279 mm, TL 798 mm). San Miguel: Volcán de San Miguel: YPM 12477.

Sight records: Ahuachapán: Parque Nacional El Imposible; Sonsonate: Bosque Las Lajas. Elevation 730–870 m.

Iguana iguana (Linnaeus 1758)

This species could be on the decline in El Salvador, presumably because of habitat loss as well as increased hunting pressure brought on by the expanding human population. Three juvenile *Iguana iguana* were observed in Parque Nacional El Imposible (Leenders 2003); according to park rangers this species is locally not uncommon in the protected area. We are not aware of other records of this species from Departamento Ahuachapán, either in the literature or from museum collections.

Specimens collected: 1 subadult male (SVL 215 mm). Sonsonate: Bosque Las Lajas: YPM 12451.

Sight records: Ahuachapán: Parque Nacional El Imposible. Elevation 700–800 m.

FAMILY IGUANIDAE:

SUBFAMILY POLYCHROTINAE

Norops cf. *crassulus* (Cope 1864)

This species was commonly seen at middle and high elevations on the Santa Ana volcano, in a variety of habitats. As is true in *Norops heteropholidotus*, adult *Norops* cf. *crassulus* show distinct sexual dimorphism in dewlap color (Leenders and Watkins-Colwell 2003b). Adult males have an or-

ange dewlap with cream gorgetal and marginal scales, whereas females have a small yellow dewlap with cream scales (Figure 3a–c). The cream gorgetal scales also darken in response to stress or environmental cues, as in *Norops heteropholidotus* (Leenders and Watkins-Colwell 2003b). Both *Norops crassulus* and *Norops heteropholidotus* belong to the taxonomically unresolved *crassulus* group of the beta anoles; the status of the Santa Ana population of *Norops crassulus* will be analyzed in a later paper.

Specimens collected: 7 males (SVL 33.0–45.8 mm), 5 females (SVL 48.2–50.4 mm), 5 juveniles (SVL 22.3–25.2 mm). Santa Ana: Parque Nacional Los Andes: YPM 14025–14041. Elevation 1,715–2,390 m.

Norops heteropholidotus Mertens 1952

We have previously described the sexual dimorphism in dewlap color in this species and the striking changes in gorgetal scale pigmentation in response to environmental cues (Leenders and Watkins-Colwell 2003b). Female *Norops heteropholidotus* generally have a small yellow dewlap (Figure 3e), whereas males have a large red dewlap with white gorgetal and marginal scales (Figure 3d). Here we also report an aberrant adult female *Norops heteropholidotus* (YPM 14057) from Parque Nacional Montecristo, with an orange dewlap and cream gorgetal and marginal scales (Figure 3f), which is similar to the dewlap color in the related *Norops crassulus*.

On 16 November 2002, we observed 6 *Norops heteropholidotus* in Departamento Chiquimula, Guatemala, in an area of

cloud forest straddling the borders of El Salvador, Guatemala and Honduras (see Figure 2b). Three were captured to confirm identification and released at the site after being photographed (because of the lack of a collection permit); photographs of 2 specimens were taken (YPM 1101, 1102). Köhler and McCranie (1998) reported that the distribution of *Norops heteropholidotus* comprised 2 isolated localities in northwestern El Salvador and 3 in the Departamento Ocotepeque, Honduras. Although the individuals observed are undoubtedly part of the population from Parque Nacional Montecristo, El Salvador, this represents the first documented sighting of *Norops heteropholidotus* in Guatemala.

Specimens collected: 16 males (SVL 31.0–50.0 mm), 5 females (SVL 36.5–53.3 mm), 5 juveniles (SVL 25.1–30.3 mm). Chalatenango: Cerro El Pital: YPM 12479; Cerro Las Nubes: YPM 12379–12385, 12422–12423; Santa Ana: Parque Nacional Montecristo: YPM 14033, 14042–14052, 14054–14057. Elevation 1,840–2,480 m.

Photo vouchers: GUATAMALA: Chiquimula: El Trifinio: YPM 1101–1102.

Norops macrophallus (Werner 1917)

The squamation and morphometric characters of *Norops macrophallus* broadly overlap with those of *Norops cupreus*, and species diagnosis is based on differences in hemipene morphology and dewlap color of living males (Köhler and Kreutz 1999). This common lizard was found in mature forest, disturbed habitats and cultivated areas, although a preference for edge-situa-

tions could be noted. During the day, *Norops macrophallus* were invariably observed on or near the ground, usually in leaf litter. Adults frequently occupied slightly elevated and exposed perches such as logs or stilt roots, usually less than 20 cm above the ground, which are used to scan for invertebrate prey. At night, sleeping *Norops macrophallus* were collected on the upper surfaces of leaves, often several meters above the ground. Only a single juvenile (YPM 12413) was collected during the dry season, suggesting that reproduction in this species does not occur year-round.

Specimens collected: 23 males (SVL 32.6–50.0 mm), 10 females (SVL 30.7–43.4 mm), 8 juveniles (SVL 20.1–28.7 mm). Ahuachapán: Cooperativa Concepción Miramar: YPM 12332, 12401, 12410, 12414, 12416–12417, 12419; Parque Nacional El Imposible: YPM 12329, 12339, 12400, 12402, 12407–12408, 12412, 12415, 12420, 12424, 12993–12998; Sonsonate: Bosque Las Lajas: YPM 12338–12339, 12404–12406, 12409, 12411, 12418; Finca Nuevos Horizontes: YPM 12328, 12330–12331, 12333–12337, 12403, 12413. Elevation 550–1,150 m.

Norops sericeus (Hallowell 1856)

In Parque Nacional El Imposible, *Norops sericeus* generally inhabited disturbed areas at lower elevations, and was replaced by *Norops macrophallus* at higher elevations. However, a middle elevation pine plantation on the crater rim of Bosque Las Lajas yielded only *Norops sericeus*, whereas the lower elevation forest was in-

habited by *Norops macrophallus*. *Norops sericeus* was commonly seen along roadsides and in plantations on the coastal plain, where apparently it was the only *Norops* present in these open, exposed and disturbed habitats.

Specimens collected: 6 males (SVL 27.0–45.0 mm), 3 females (SVL 32.0–35.0 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12391; La Paz: Finca La Esmeralda: YPM 12390, 12392–12398.

Sight records: Sonsonate: Bosque Las Lajas. Elevation 30–950 m.

Norops serranoi Köhler 1999

This species occurs on the Pacific slope of northern Central America (Chiapas, Mexico, through Guatemala to eastern El Salvador) from sea level to 1,000 m elevation (Köhler 1999). Only juveniles were observed and collected in October; no juveniles were seen between December and February, suggesting that the species reproduces during the wet season in El Salvador. The stomach of YPM 12326 contained a large caterpillar of an arctiid moth. Arctiid caterpillars are typically covered with long, barbed hairs, and are occasionally armed with alkaloids as a means of antipredator defense (David L. Wagner, pers. comm. 2003).

Specimens collected: 3 males (SVL 60.0–72.0 mm), 4 females (SVL 51.0–75.0 mm), 2 juveniles (SVL 30.2–35.9 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12324–12326, 12447–12450, 12990–12991. Elevation 260–800 m.

FAMILY IGUANIDAE:

SUBFAMILY PHRYNOSOMATINAE

Sceloporus malachiticus Cope 1864

Throughout its range in Central America, *Sceloporus malachiticus* mostly inhabits cool mountainous habitats. The distribution of this species in El Salvador as indicated by Köhler (2000) is incorrect (see also Schmidt and others 1999): Salvadoran *Sceloporus malachiticus* are not restricted to high and middle elevations, as we also found the species in hot and arid lowlands in coffee plantations and other disturbed habitats, as well as in mature broadleaf forest. At least in the lower elevation populations, juveniles seemed to be mostly terrestrial (several were found underneath logs), whereas adults typically were seen basking high in trees.

Female Salvadoran *Sceloporus malachiticus* reach sexual maturity at an SVL of 60 to 70 mm (Schmidt and others 1999). Reproduction is seasonal in Costa Rica (Marion and Sexton 1971; Reznick and Sexton 1986), where females only give birth once a year, during the dry season. Schmidt and others (1999) reported juveniles in January, April, October and November in El Salvador. All of our young juveniles were collected in January. YPM 12481 was collected at an elevation of 2,480 m on Cerro El Pital, 280 m higher than the highest record for *Sceloporus malachiticus* in El Salvador (Schmidt and others 1999). YPM 12356 had an as of yet unidentified parasitic worm in its nostril.

Specimens collected: 5 adult males (SVL 76.0–98.2 mm), 7 adult females (SVL 67.0–82.8 mm), 16 juveniles (9 male, 7 fe-

male). Ahuachapán: Cooperativa Concepción Miramar: YPM 12306–12310, 12349, 12353, 12355, 12359–12360; Parque Nacional El Imposible: YPM 12356, 12357, 12350; Chalatenango: Cerro El Pital: YPM 12481; San Miguel: Volcán San Miguel: YPM 12472, 12480; San Salvador: San Salvador: YPM 12361; Sonsonate: Bosque Las Lajas: YPM 12351, 12354; Finca Nuevos Horizontes: YPM 12352. Elevation 720–2,480 m.

Sceloporus squamosus Bocourt 1874

This species is oviparous (Werning 2002). Many juveniles were present during the months of November through February, suggesting a peak in reproductive activity coinciding with the dry season.

Specimens collected: 4 males (SVL 32.6–49.0 mm), 6 females (SVL 35.0–50.0 mm), 8 juveniles. Ahuachapán: Parque Nacional El Imposible: YPM 12368, 12370–12371, 12373–12377; La Paz: Finca La Esmeralda: YPM 12372, 12378; Santa Ana: San Diego y La Barra: YPM 12471; Sonsonate: Finca Nuevos Horizontes: YPM 12315–12319, 12369. Elevation 250–1,250 m.

Sceloporus variabilis Wiegmann 1834

Sceloporus variabilis was commonly found amidst scrubby vegetation in arid regions of eastern El Salvador, and was replaced at higher elevations by *Sceloporus squamosus*. In western El Salvador, the latter species occurred in habitats similar to those occupied by *Sceloporus variabilis* in the eastern regions of the country. Savage (2002) men-

tions a peak in reproductive activity for Costa Rican individuals from July to November. The relative absence of hatchlings of this species in suitable locations in El Salvador from November to December agrees with the reproductive pattern reported for Costa Rican individuals.

Specimens collected: 3 males (SVL 55.4–71.1 mm), 4 females (SVL 52.9–58.5 mm), 1 juvenile (SVL 36.6 mm). Morazán: Rio Sapo: YPM 14005–14011; Rio Negro: 14012. Elevation 655–995 m.

FAMILY SCINCIDAE

Mabuya unimarginata Cope 1862

This species is often found in disturbed habitat near human settlements, at the edges of forested regions and in clearings in forested regions or on plantations. While the species is mainly terrestrial in forested areas with a leaf litter layer, it is arboreal in open terrain (that is, on plantations, where it prefers coconut palms and hides in the leaf axils of old fronds). The species has black mesenteries.

Specimens collected: 7 specimens (SVL 53.0–80.0 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12311, 12444–12446; La Paz: Finca La Esmeralda: YPM 12443; Morazán: Rio Sapo: YPM 14002; San Miguel: Volcán San Miguel: YPM 12470. Elevation 115–800 m.

Mesoscincus managuae (Dunn 1933)

Our vouchers are the only records of which we are aware for *Mesoscincus managuae* from El Salvador. YPM 12468 represents a

country record (see Greenbaum and others 2003), and its discovery in northern El Salvador constitutes a substantial northward expansion of the known geographic distribution of this species. However, the precise locality for this specimen according to Greenbaum and others (2003) is somewhat ambiguous (the reported GPS coordinates could be in error, since they do not correspond with the locality mentioned). The subsequent collection of YPM 12436 in western El Salvador again extended the species' geographic range. The proximity of the YPM 12436 collecting site to the Guatemalan border, and the fact that dry scrub forest extends uninterruptedly into Guatemala, suggests that *Mesoscincus managuae* may eventually be added to the herpetofauna of that country as well.

Specimens collected: 2 specimens (SVL 96.8–120.0 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12436; Santa Ana: N side of Lago de Güija: YPM 12468. Elevation 425–710 m.

Sphenomorphus assatus (Cope 1864)

Two of the 3 specimens (YPM 12314, 12439) of this small leaf litter skink were collected at the type locality, the base of the Izalco volcano. A third specimen collected in Parque Nacional El Imposible represents the first record for the species from Departamento Ahuachapán.

Specimens collected: 3 specimens (SVL 40.0–52.5 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12992; Sonsonate: Finca Nuevos Horizontes: YPM 12314, 12439. Elevation 760–1,240 m.

FAMILY GYMNOPTHALMIDAE

Gymnophthalmus speciosus (Hallowell
1861)

Our specimens are apparently the first records for Departamento Ahuachapán. This species was common on roadsides and other sunny, exposed areas with sufficient leaf litter.

Specimens collected: 4 specimens (SVL 42.2–43.7 mm), all with regenerating tails. Ahuachapán: Cooperativa Concepción Miramar: YPM 12441; Parque Nacional El Imposible: YPM 12313, 12440, 12442. Elevation 775–895 m.

FAMILY TEIIDAE

Ameiva undulata (Wiegmann 1834)

Several of the females collected (for example, YPM 12294, 12298, 12454) were gravid and contained between 5 and 9 oviducal eggs, up to 18 mm by 10 mm in size. All juveniles collected during the dry season were of comparable size, suggesting a peak in reproductive activity in this species. YPM 12465 has a forked tail growing on an old fracture. The main tail is 82.2 mm long with the bifurcation beginning at 20 mm from the vent; the second tail is 2.3 mm long and branches on the ventral side of the main tail. YPM 12298 and YPM 12454 contain unidentified nematodes in the body cavity near the vent, and cysts attached to the ventral integument.

Specimens collected: 4 males (SVL 79.8–112.4 mm), 7 females (SVL 74.7–102.6 mm), 18 juveniles (SVL 34.4–71 mm). Ahuachapán: Cooperativa Concepción Mi-

ramar: YPM 12293, 12295, 12303–12304, 12457, 12460, 12462, 12467; Parque Nacional El Imposible: YPM 12296, 12298–12300, 12454–12455, 12459, 12461, 12463; La Libertad: Jardines del Volcán: YPM 12469; Morazán: Río Sapo: YPM 14000–14001; Sonsonate: Bosque Las Lajas: YPM 12464–66; Finca Nuevos Horizontes: YPM 12294, 12297, 12301–12302, 12456, 12458.

Sight records: La Paz: Finca La Esmeralda. Elevation 115–1,200 m.

Cnemidophorus deppii Wiegmann 1830

The squamation and color pattern of YPM 12435 agree with the description in Mertens (1952). In El Salvador this species seems to be restricted to the coastal plain. At Finca La Esmeralda it was found in sympatry with *Ameiva undulata*, although *Cnemidophorus* preferred drier and more open habitat than *Ameiva undulata*, which was more often found under cover of vegetation.

Specimens collected: 1 adult male (SVL 76 mm, TL 256 mm). La Paz: Finca La Esmeralda: YPM 12435.

Sight records: San Salvador: International Airport. Elevation 115–250 m.

REPTILIA: SERPENTES

FAMILY BOIDAE

Boa constrictor Linnaeus 1758

Our specimens agree in pattern and pholidosis characteristics with the descriptions of Mertens (1952) and Wilson and Meyer (1985). Salvadoran *Boa constrictor* are habitat generalists, found in relatively undis-

turbed forest as well as in cultivated areas and near human settlements. Two of the specimens, YPM 12327 and 12438, had recently eaten a Deppe's squirrel (*Sciurus deppei*) and a big-eared climbing rat (*Otodylomys phyllotis*), respectively (Leenders and Watkins-Colwell 2003c).

Specimens collected: 4 females (SVL 986–2170 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12323, 12327, 12438; Morazán: Río Sapo: YPM 13994. Elevation 530–750 m.

FAMILY COLUBRIDAE

Coniophanes fissidens (Günther 1858)

YPM 12305 and YPM 12364 were found dead on an isolated dirt road through a coffee plantation and are badly damaged. No vehicles had passed on this road before the discovery of the specimens, but possibly free-ranging horses had trampled both snakes. YPM 12366 has an intact tail, although this species is known for its high tail-breakage incidence (Mendelson 1992). Our specimens from Ahuachapán apparently are the first records for this Department.

Pholidosis characteristics for YPM 12364–12366 are as follows: ventrals 123–126 (n=3), subcaudals in specimen with intact tail 89, anal plate divided; loreal scale present; 2 preoculars, 2 postoculars, temporals 1+2; supralabials 8, 4th and 5th enter orbita (n=3), or 9 with 5th and 6th entering orbita (n=1); 10–11 infralabials; dorsal scales smooth, in 21–21–17 rows. Apical scale pits absent. The single individual with an intact tail measures 209 mm SVL (TL 312 mm); av-

erage SVL in this small sample is 267 mm.

Specimens collected: 2 males (YPM 12365–12366, as indicated by everted hemipenes), 1 female (YPM 12364), 1 sex undeterminable (YPM 12305). Ahuachapán: Cooperativa Concepción Miramar: YPM 12365; Parque Nacional El Imposible: YPM 12366; Sonsonate: Finca Nuevos Horizontes: YPM 12305, 12364. Elevation 1,100–1,280 m.

Drymobius margaritiferus (Schlegel 1837)

Several adults were observed in Parque Nacional El Imposible, but only one was collected. The color pattern of Salvadoran *Drymobius margaritiferus* is paler than in Atlantic populations and of those north of the Isthmus of Tehuantepec (Savage 2002); the pattern of yellowish cream to brown spots on the center of each dorsal scale is typical of populations ranging from Chiapas, Mexico, and western Guatemala to El Salvador (Mertens 1952). The dorsal scales of YPM 12499 are adorned with a low keel, edged in black, and accentuated by a yellow stripe running through the center of each scale; this pattern is more pronounced toward the tail where each scale has an isolated light center. Pholidosis characteristics of YPM 12429 agree with those of Mertens (1952) and Wilson and Meyer (1985).

Specimens collected: 1 male (SVL 556 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12429. Elevation 750–780 m.

Leptodeira annulata (Linnaeus 1758)

Mertens (1952) mentions specimens of *Leptodeira annulata polysticta* with more

than 200 ventral scales and describes the species as arboreal. Based on other details of his description, we consider Mertens' identifications in error; these specimens should be referred to *Leptodeira septentrionalis*. Köhler (1996) records a small sample of *Leptodeira annulata* with ventral scale counts of 165 to 172, with one specimen (SMF 77419) having 205. We also consider it likely that SMF 77419 is a *Leptodeira septentrionalis*. *Leptodeira annulata* is a predominantly terrestrial snake that feeds mainly on amphibians. Our specimen was collected under a log at the edge of a small puddle in the drying bed of the Rio Sapo that contained metamorphosing tadpoles of *Scinax staufferi* and *Rana maculata*. It appears to be the first record for *Leptodeira annulata* from Departamento Morazán.

Pholidosis characteristics for YPM 14003 are as follows: ventrals 168, subcaudals 84, anal plate divided; loreal scale present; 3 preoculars, 2 postoculars, temporals 1+2; supralabials 8, 4th and 5th enter orbita; 10 infralabials; dorsal scales smooth, in 21–21–17 rows. Apical scale pits present.

Specimens collected: 1 female (SVL 305 mm, TL 410 mm). Morazán: Rio Sapo: YPM 14003. Elevation 674 m.

Leptodeira septentrionalis (Kennicott 1859)

Our specimens agree with the descriptions in Mertens (1952) and Wilson and Meyer (1985). This widespread and adaptable species is one of the most common snakes in El Salvador. We collected specimens from habitats as diverse as human habitations, shade-grown coffee plantations, ever-

green broadleaf forest, and cloud forest. YPM 14060 was collected in the branches of a tree overhanging a cascading mountain stream, at a height of approximately 2 m; on capture it regurgitated a recently caught adult *Rana maculata*. The individuals collected in Departamento Ahuachapán (YPM 12430, 14058) appear to be the first records for this Department.

Pholidosis characteristics are as follows: ventrals 196–205, subcaudals 79–100, anal plate divided; loreal scale present; 3 to 4 preoculars, usually 3, 2 postoculars, temporals 1+2; supralabials 8, 4th and 5th enter orbita (9, 5th and 6th entering orbit on one side of YPM 14059); 10 infralabials; dorsal scales smooth, in 21 to 23 rows at mid-body, 17 rows when counted 1 head length anterior to vent. Apical scale pits present. Largest individual (YPM 14060) measures 783 mm TL.

Specimens collected: 2 males (SVL 520–554 mm), 3 females (SVL 454–582 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12430, 14058; Morazán: Nahuaterique: YPM 14060; Santa Ana: Parque Nacional Los Andes: YPM 14061; Parque Nacional Montecristo: YPM 14059. Elevation 760–1,850 m.

Ninia sebae (Duméril, Bibron and Duméril 1854)

The 3 specimens of *Ninia sebae* were collected under large logs in the heavily cultivated habitat of a shade-grown coffee plantation. YPM 12312 and 12363 contained 2 and 4 oviducal eggs, respectively (lengths 20 to 25 mm, diameter 6 to 7 mm).

Pholidosis characteristics are as follows:

ventrals 142–148, subcaudals 55–59, anal plate single; loreal scale absent; 1 preocular, 2 postoculars, temporals 1+2; supralabials 7–8, 3rd and 4th enter orbita; 6 to 8 infralabials; dorsal scales striated and unicarinate, in 19 rows throughout. Apical scale pits absent. The largest individual (YPM 12363) measures 356 mm TL. These characteristics agree with those presented in Mertens (1952) and Wilson and Meyer (1985).

Specimens collected: 3 adult females (SVL 198–285 mm). Ahuachapán: Cooperativa Concepción Miramar: YPM 12312, 12362–12363. Elevation 950–1,100 m.

Oxybelis aeneus (Wagler 1824)

This primarily arboreal snake is known to occasionally descend to the ground to hunt (Henderson and Nickerson 1977), and terrestrial lizards have been reported as its prey items (see Smith and Grant 1958). The leaf litter and tall grass of the forest edge where YPM 12426 was collected harbored many *Mabuya unimarginata*, and this animal may have been stalking lizard prey. YPM 13999 was climbing in scrubby thorn brush approximately 1 m above the ground. YPM 12426 was heavily infested with mites beneath the dorsal scales. YPM 12462 appears to be the first record of the species for Departamento Ahuachapán.

Pholidosis characteristics for YPM 12426 and 13999, respectively, are as follows: ventrals 188 (187), subcaudals 168 (174), anal plate divided; loreal scale absent; 1 preocular, 2 postoculars, temporals 1+2; supralabials 9/10, 5th and 6th (4th, 5th and 6th in one side of YPM 13999)

enter orbita; 10 infralabials; dorsal scales smooth, in 15–17–13 rows. Apical scale pits absent. These characteristics agree with Mertens (1952) and Wilson and Meyer (1985).

Specimens collected: 1 adult male (SVL 802 mm, TL 1314 mm), 1 adult female (SVL 770 mm, TL 1300 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12426; Morazán: Rio Sapo: YPM 13999. Elevation 674–760 m.

Oxybelis fulgidus (Daudin 1803)

Oxybelis fulgidus is a common snake in El Imposible National Park, based on the number of individuals observed relative to the number of person-hours spent in the field. Our record from Departamento Ahuachapán appears to be the first for this species from northwestern El Salvador. All specimens are uniform leaf green except for a narrow white stripe on the venterolateral edges of the body. The skin is white with a zebra-like pattern of black diagonal stripes, visible between the scales only when the skin is stretched. The tongue is green; individuals were seen crawling through vegetation with the tongue extended continuously (this unexplained behavior has been noted in the genus *Oxybelis* by Henderson and Binder 1980). YPM 12348 was taken in a mist net where it was attempting to feed on an entangled ruddy woodcreeper (*Dendrocincla homochroa*). This capture indicates *Oxybelis fulgidus* occasionally descends to the ground to forage (Leenders and Watkins-Colwell 2003d). The other 2 specimens were caught in shrubs and a small tree, at heights up to 2.5 m.

Pholidosis characteristics for YPM 12348, 12427 and 12431, respectively, are as follows: ventrals 201, 204, 210, subcaudals 168, 158, 156, anal plate divided; loreal scale absent; 1 preocular, 2 postoculars, temporals 1+2; supralabials 10/11, 5th, 6th and 7th enter orbita; 10/12 infralabials; dorsal scales smooth, except vertebral and 4 paravertebral scale rows keeled, in 17–17–13 rows. Apical scale pits absent. These characteristics agree with the descriptions in Mertens (1952) and Wilson and Meyer (1985).

Specimens collected: 1 female (SVL 1250 mm), 2 males (SVL 1088–1285 mm). Ahuachapán: Parque Nacional El Imposible: YPM 12348, 12427, 12431. Elevation 750–800 m.

Rhadinaea godmani (Günther 1865)

Mertens (1952) describes 2 males whose scalation and coloration characteristics agree with our female. The only salient difference is that YPM 13000 has fewer subcaudal scales (87) than reported (91) by Mertens (1952); since YPM 13000 has an intact tail, this is most likely explained by sexual dimorphism. Few specimens of *Rhadinaea godmani* are known from El Salvador; it is recorded from the highlands of Sonsonate and Chalatenango (Mertens 1952; McCranie and Wilson 1992). YPM 13000 appears to be the first record for Departamento Santa Ana.

Our specimen was collected from under a log during late afternoon and was kept alive overnight. When it was removed from the collecting bag in the morning, it appeared dead, showing no reaction to

being handled, nor any visible dilation or contraction of the pupil. However, shortly after being measured and photographed, faint muscular responses were noted, and the snake resumed normal activity only hours later after ambient temperatures had risen to 16°C or 17°C (nighttime low temperatures in the area had reached 13°C). We are assuming torpor may be a response for survival at the low temperatures prevalent in this species' highland habitat.

Pholidosis characteristics for YPM 13000 are as follows: ventrals 169, subcaudals 80, anal plate divided; 1 loreal scale; 1 preocular, 2 postoculars, temporals 1+2; supralabials 8, 4th and 5th enter orbita; 9 infralabials; dorsal scales smooth, in 21–21–21 rows. Apical scale pits absent.

Specimens collected: 1 female (SVL 336 mm, TL 457 mm). Santa Ana: Parque Nacional Los Andes: YPM 13000. Elevation 1,717 m.

Senticolis triaspis (Cope 1866)

YPM 12428 displays the typical juvenile color pattern described for the northern form of the subspecies *Senticolis triaspis mutabilis* fide Dowling (1960): 82 dark-outlined, maroon blotches (53 on body and 29 on tail) on a tan background. A larger, uniformly tan female was collected in the same locality, but escaped before being measured and preserved; only faint traces of the juvenile pattern were visible on the head and vertebral area of this individual.

Throughout Central America and Mexico, *Senticolis triaspis* is found in seasonally dry forests and is mostly nocturnal during

the driest and hottest months (Leenders, personal observation). Both Salvadoran specimens were active when found: the male was caught at the base of a small rock pile at 1140 h, whereas the female was discovered at 1.2 m while entering a crevice in a tree trunk at 1350 h.

Pholidosis characteristics are as follows: ventrals 260, subcaudals 110, anal plate divided; loreal scale present; 1 preocular, 2 postoculars, temporals 3+3; supralabials 8, 4th and 5th enter orbita; 11 infralabials; dorsal scales smooth, in 28–31–21 rows. Apical scale pits present. Total length 630 mm. The specimen agrees well with the descriptions given by Mertens (1952) and Wilson and Meyer (1985).

Specimens collected: 1 male (SVL 500 mm, TL 630 mm) as determined by everted hemipenes. Sonsonate: Bosque Las Lajas: YPM 12428. Elevation 800–970 m.

Spilotes pullatus (Linnaeus 1758)

YPM 12453 has olive brown to black dorsal scales on a yellow background. The base of each dorsal scale is uniformly yellow, as is the snake's ventral surface. A variegated pattern of oblique black stripes is evident in this specimen when it flattens its body, a coloration historically attributed to the subspecies *Spilotes pullatus mexicanus* (Schmidt 1928; Amaral 1929), although extensive individual variation and ontogenetic color change hamper recognition of geographical races in this species (Wilson and Meyer 1985; Savage 2002). This snake was discovered basking on a low bush along a riverbed, at a height of approximately 2 m, and it fled rapidly through the

tree tops when approached. Interviews with campesinos at our field sites indicated that people were not familiar with this species, suggesting it either escapes detection or is uncommon. Its occurrence in El Salvador may be restricted to larger tracts of relatively undisturbed forest. This appears to be the first record of *Spilotes pullatus* for Departamento Ahuachapán.

Pholidosis characteristics are as follows: ventrals 222, subcaudals 95 (tail tip missing), anal plate entire; loreal scale present; 1 preocular, 2 postoculars, temporals 1+1; supralabials 8, 4th and 5th enter orbita; 9 infralabials; dorsal scales keeled, except lower scale rows smooth, in 17–18–14 rows. Apical scale pits absent. Scalation characteristics agree with those reported for Honduran specimens by Wilson and Meyer (1985).

Specimens collected: 1 male (SVL 1874 mm, TL 2426 mm [tail tip missing]) as determined by everted hemipenes. Ahuachapán: Parque Nacional El Imposible: YPM 12453. Elevation 600 m.

Stenorrhina freninvillei Duméril, Bibron and Duméril 1854

Both our specimens present 5 longitudinal black stripes on a cream background, located on scale rows 3+4, 6, and the mid-dorsal scale row (counting up from the ventralia). Their characteristics agree with the descriptions by Mertens (1952) and Wilson and Meyer (1985).

Pholidosis characteristics for the male, YPM 12476, are as follows: ventrals 169, subcaudals 37, anal plate divided. Rostral scale large; prenasals fused with adjacent

internasals; a loreal scale is present; 1 preocular, 2 postoculars, temporals 1+2; supralabials 7, 3th and 4th enter orbita; 7 infralabials; dorsal scales smooth, in 19–17–16 rows. Pholidosis characteristics for the female, YPM 12999, are as follows: ventrals 197, subcaudals 31, anal plate divided. Rostral scale large; prenasals fused with adjacent internasals; a loreal scale is present; 1 preocular, 2 postoculars, temporals 1+2; supralabials 7, 3th and 4th enter orbita; 7 infralabials; dorsal scales smooth, in 17–17–15 rows.

Specimens collected: 1 female (SVL 354 mm, TL 702 mm), 1 male (SVL 337 mm, TL 404 mm). Santa Ana: N side of Lago de Güija: YPM 12476; Parque Nacional Los Andes: YPM 12999. Elevation 445–1,700 m.

Tantilla brevicauda Mertens 1952

The color characteristics of YPM 12367 are as follows: venter immaculate cream, gradually changing to white posteriorly; scales dark brown with speckling of light dots, mostly concentrated along lateral edges; band along midline of each scale relatively devoid of light pigment; apex of each scale dark. This color pattern is most pronounced on the central 9 dorsal scale rows, producing the effect of dark longitudinal stripes running along the center of these scale rows. The light pigment is less concentrated on the ventrolateral scale rows, and a faint lateral stripe is present on scale row 3. A light orange to tan nuchal fleck is located on dorsal scale row 1, extending onto the parietal scales; the posterior margin is straight, but the nuchal marking extends anteriorly along the suture and mar-

gins of the parietal scales in a 3-pronged marking; light fleck present on snout, but there are no light markings on supralabials.

YPM 12367 agrees with specimens mentioned by Mertens (1952), but differs in some aspects from the description of his type series. The light vertebral stripe reported for the holotype (SMF 43243) and paratype (SMF 43244) are absent in YPM 12367. Mertens also comments on the bright red undersides of the tails on his specimens, also lacking in YPM 12367. YPM 12367 was found at night crossing a trail through secondary vegetation.

Pholidosis characteristics are as follows: ventrals 149, subcaudals 23, anal plate divided. A loreal scale is absent; 1 preocular, 2 postoculars, temporals 1+1; supralabials 7, 3th and 4th enter orbita; 6 infralabials; dorsal scales smooth, in 15 rows throughout; no apical scale pits.

Specimens collected: 1 adult male (SVL 153 mm, TL 170 mm), as indicated by everted hemipenes. Ahuachapán: Parque Nacional El Imposible: YPM 12367. Elevation 750 m.

Tropidodipsas fischeri Boulenger 1894

YPM 14024 was found in a barren, rocky area free of vegetation, on the crater rim of the Santa Ana volcano. This animal had been recently killed by a raptor, and is too badly damaged to measure accurately or to sex. YPM 14023 was found below a log.

Pholidosis characteristics for YPM 14023 are as follows: ventrals 176, subcaudals 60, anal plate entire. A loreal scale is present; no preoculars, 1 postocular, temporals 1+2; supralabials 6 to 7, 3th and 4th, and, 4th and 5th, enter orbita, respectively;

6 to 8 infralabials; dorsal scales weakly keeled, most prominently on 4 mid-dorsal rows; dorsal scales in 17 rows throughout; no apical scale pits.

Specimens collected: 2 adults, sex undetermined, (YPM 14023: SVL 380 mm, TL 473 mm). Santa Ana: Parque Nacional Los Andes: YPM 14024; Parque Nacional Montecristo: YPM 14023. Elevation 2,020–2,415 m.

Tropidodipsas sartorii Cope 1863

Our specimen agrees with descriptions of this species in Mertens (1952) (as *Tropidodipsas carrii*) and Meyer and Wilson (1985), except that it lacks the loreal scale in Honduran specimens reported by the later authors.

Pholidosis characteristics are as follows: ventrals 181, subcaudals 67, anal plate entire. A loreal scale is absent; 1 to 2 preoculars, 2 postoculars, temporals 1+2; supralabials 7 to 8, 4th and 5th enter orbita; 9 infralabials; dorsal scales smooth to lightly keeled, in 17 rows throughout; no apical scale pits.

Specimens collected: 1 juvenile (SVL 234 mm, TL 291 mm). Santa Ana: Parque Nacional Montecristo: YPM 14022. Elevation 1,820 m.

FAMILY VIPERIDAE:

SUBFAMILY CROTALINAE

Atropoides nummifer (Rüppell 1845)

Pholidosis characteristics are as follows: ventrals 130, 23 undivided subcaudals, anal plate entire. Dorsal scales are heavily keeled and in 25–25–21 rows. Conspicuous mid-

dorsal ridge present. Apical scale pits absent. Small occipital scales keeled, except for slightly enlarged supraoculars. Supralabials 10, infralabials 12.

Specimens collected: 1 adult female (SVL 650 mm, TL 710 mm). Sonsonate: Bosque Las Lajas: YPM 12425. Elevation 970 m.

Cerrophidion godmani (Günther 1863)

This is a common snake at higher elevations in Volcan Santa Ana. It occurs in vegetable patches, gardens and other cultivated areas, as well as in the low scrub forest surrounding the crater rim, preferring open areas. Within the forest interior, *Cerrophidion godmani* is mostly found on or next to trails and old logging roads. YPM 12478 contained in its stomach a partly digested rodent, most likely *Heteromys desmarestianus* (Heteromyidae: Rodentia), a common terrestrial species of Central American highland locales (Reid 1997). This prey item has been recorded from Costa Rican *Cerrophidion godmani* (Campbell and Solórzano 1992).

Pholidosis characteristics are as follows: ventrals 129–145, 27–32 undivided subcaudals, anal plate entire. Dorsal scales are keeled and in 19 to 23 rows at midbody and 17 to 19 rows when measured one head-length anterior to the vent. Apical scale pits present, but barely discernible. Small occipital scales keeled, except for enlarged supraoculars. Juvenile (YPM 14018) with bright yellow tail tip. Maximum total length (YPM 12478) is 547 mm.

Specimens collected: 1 male (SVL 489 mm), 4 females (SVL 392–431 mm), 1 ju-

venile (SVL 173 mm, TL 192). Chalatenango: Cerro El Pital: YPM 12478; Santa Ana: Parque Nacional Los Andes: YPM 14017–14020; Parque Nacional Montecristo: YPM 14021. Elevation 1,600–2,440 m.

Conclusions

Salvadoran amphibian and reptile populations have until recently remained largely unstudied and findings based on specimens from adjacent areas were extrapolated to Salvadoran individuals (see Lynch 2000). The current study and other recent studies of El Salvador amphibians and reptiles have yielded significant findings (Köhler 1999; Köhler and Kreutz 1999; McCranie and Köhler 1999). Our work has raised questions regarding the taxonomic status of Salvadoran populations of *Bolitoglossa conanti*, *Eleutherodactylus rhodopis*, *Norops crassulus* and *Sceloporus malachiticus*. In addition, the status of several species known to occur in El Salvador (or formerly known to occur there before adjustment of the international boundaries in 1992) remains uncertain. We have no verified information on the occurrence of *Bolitoglossa salvinii* (Gray 1868), *Hyla catracha* Porras and Wilson 1987, *Celestus atitlanensis* Smith 1950, and certain *Plectrohyla* and *Abronia* on Salvadoran territory, although park rangers and local campesinos recognized descriptions of *Abronia* and *Celestus atitlanensis* in Parque Nacional Montecristo and El Imposible, respectively (the interviewees considered these species “rare but still present”).

Our fieldwork in shade-grown coffee areas (such as Finca Nuevos Horizontes,

Concepción Miramar) and former coffee plantations abandoned for 20 to 25 years (parts of the La Fincona and San Benito sectors of Parque Nacional El Imposible) indicates that these cultivated areas are to some extent taking over the role of the original broadleaf forest vegetation. The presence of forest-dwelling species such as *Corytophanes percarinatus*, and possibly *Celestus atitlanensis*, in formerly deforested areas also suggests that restoration of habitat is possible if intensive agricultural practices and disturbances by human activity can be curtailed. Parallel findings have been reported in migratory bird surveys, which show that forest birds use shade-grown coffee plantations as a surrogate for natural forest habitat (Oliver Komar, pers. comm. 2001). However, low coffee prices in recent years currently jeopardize the continued existence of these surrogate forest habitats, since local farmers are under pressure to cultivate more environmentally detrimental, but profitable, crops such as cotton and sugar cane.

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